DOCUMENT RESUME

ED 214 083 CG 015 819

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TITLE Effect of Work Group Size and Task Size on Observers' Job Characteristics Ratings.
PUB DATE Aug 81
NOTE 26p.; Paper presented at the Annual Convention of the American Psychological Association (89th, Los Angeles, CA, August 24-26, 1981).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Feedback; *Job Satisfaction; *Job Skills; *Motivation; Observation; *Performance Factors; Skill Analysis; Task Analysis; Work Attitudes; *Work Environment
IDENTIFIERS *Autonomy (Personal); *Job Dimensions

ABSTRACT

The Job Characteristics Model proposed by Hackman and his associates postulates that positive personal and work outcomes are derived from five core job dimensions: skill variety, task identity, task significance, autonomy, and feedback from the job. The effects of the number of workers (work group size) and the number of tasks (task size) on perceptions of job characteristics were investigated using a simulated assembly line job. Subjects (N=40) observed videotaped workers performing a job in four combinations of work group size and task size, and rated the respective jobs on dimensions taken from the Job Characteristics Model, using the Job Rating Form. Results indicated that jobs performed by smaller work groups were perceived as significantly higher on the job dimensions of skill variety, task identity, feedback from the job, and autonomy, and had greater potential for employee motivation. Significant main effects were also found for task size on the dimensions of skill variety and feedback from the job; jobs with larger tasks were seen as having greater motivating potential for the employees. The findings suggest that work group size appears to have a more potent effect than task size. (Author/NRB)

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ED214083

Paper presented at the American Psychological Association Convention, Los Angeles, California, August, 1981

# Effects of Work Group Size and Task Size on Observers' Job Characteristics Ratings

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CG 015819

Abstract

The effects of number of workers (work group size) and number of tasks (task size) on perceptions of job characteristics were investigated using a simulated assembly line job. Forty subjects observed workers performing a job in four combinations of work group size and task size, rating the respective jobs on dimensions taken from the Job Characteristics Model (Hackman & Oldham, 1975). The results indicated that jobs performed by smaller work groups were perceived by observers as significantly higher on four of the six dimensions and had greater potential for employee motivation. Significant main effects were also found for task size on three of the six dimensions such that jobs with larger tasks had higher mean scores and were seen as having greater motivating potential for the employees. A significant interaction was noted for only one job characteristic dimension. An ecological psychological analysis (manning theory) of the data supported these results and suggests theoretically useful interpretations of the data.

# Effects of Work Group Size and Task Size on Observers' Job Characteristics Ratings

The job characteristics model proposed by Hackman and his associates (Hackman & Lawler, 1971; Hackman & Oldham, 1975, 1976) postulates that positive personal and work outcomes (e.g., high internal motivation, high work satisfaction, high productivity, and low absenteeism and turnover) are derived from five "core" job dimensions. These dimensions are: Skill Variety, Task Identity, Task Significance, Autonomy, and Feedback. The link between these job dimensions and personal and work outcomes is mediated by three critical psychological states (i.e., Experienced Meaningfulness of the Work, Experienced Responsibility for Work Outcomes, and Knowledge of Results). The multiplicative combination of these three psychological states results in the motivating potential a job has for the attainment of personal and work outcomes (Hackman & Oldham, 1976).

In general, empirical evidence has supported the hypothesized relationships among the core job dimensions, the critical psychological states and the outcome variables (e.g., Hackman & Oldham, 1976; Oldham, Hackman, & Pearce, 1976; Umstot, Bell, & Mitchell, 1976). Increased levels of Skill Variety, Job Autonomy, Task Significance, Task Identity, and Feedback tend to be significantly correlated with higher levels of internal work motivation, general satisfaction, growth satisfaction, and the three psychological states. Thus, the job characteristics model appears to have some validity.

In recent investigations of the model through the utilization of

Hackman and Oldham's (1975) Job Diagnostic Survey (JDS), researchers have assessed factors which may affect employees' perceptions of the extent to which their jobs possess the five core job dimensions (e.g., Oldham, Hackman, & Stepina, Note 1; Schmitt & Fitzgerald, Note 2; White & Mitchell, 1979). Two such factors which might influence perceptions of these dimensions are work group size and task size.

Previous research (e.g., Porter & Lawler, 1965) has indicated that increasing work group size negatively affects employees on a number of outcome variables and critical psychological states. More recently, Schmitt and Fitzgerald (Note 2) demonstrated that work group size was inversely related to Task Identity. That is, employees in smaller work groups rated their job as requiring the completion of a whole and identifiable piece of work to a greater extent than employees in larger work groups.

The number of tasks an employee is required to perform has also been shown to be beneficial on a number of outcome variables. Friend and Burns (1977) studied the effects of task size on overall job satisfaction. Their data suggest that employees react more positively to larger sized jobs than to jobs smaller in size. Shepard (1970) demonstrated a significant negative relationship between functional specification and job satisfaction. That is, a greater number of tasks (horizontal job loading) was associated with greater job satisfaction. In addition, Hackman, Oldham, Janson and Purdy (1975) posit that combining tasks increases the Skill Variety and Task Identity job dimensions. In short, increasing task size and decreasing work group size should independently affect the motivating potential of a job through

heightened perceptions of the extent to which the job possesses the five core job dimensions.

The combination of work group size and task size factors can be conceptualized as lying on a single dimension of staffing of the work group. That is, a large work group with a relatively small sized task could be considered as overstaffed, while a small sized work group with a relatively large sized task could be considered as understaffed. Similarly, either a large sized work group with a large sized task or a small sized work group with a small sized task could be seen as relatively adequately staffed. This taxonomy of task and work group sizes has been theorized and researched by ecological psychologists for some time (see Barker, 1968; Wicker, 1979) and falls under the research domain of manning theory.

Empirical evidence in the area of manning theory closely coincides with the job enrichment and job enlargement literature (see Greenberg, 1979). Group members in undermanned, or understaffed groups (a) engage in more important and difficult tasks (Wicker, 1968, 1969; Wicker, McGrath, & Armstrong, 1972), (b) increase their performance levels (Baird, 1969; Callander, 1970), (c) increase the perceived importance of group membership (Wicker, 1968, 1969; Wicker et al., 1972), and (d) increase their level of participation in group activities (Gump & Friesen, 1964; Wicker, 1969). Apparently, the consequences of undermanned groups are similar to the outcomes of enriched and enlarged jobs while the consequences of overmanned groups are similar to those for more specialized jobs (Greenberg, 1979). Thus, one would expect that as groups decrease in their degree of staffing, the extent

of the five "core" job dimensions should also increase.

More importantly, however, is the prediction manning theory makes regarding similarly staffed work groups. In the case of a large work group with a large sized task and a small work group with a small sized task, little difference should be perceived in the extent to which these work groups possess the core job characteristics. Consequently, a simultaneous investigation of task size and work group size should yield significant differences only between under, adequately and overstaffed work groups on the core job characteristics.

In sum, the purpose of the present research was to ascertain the independent and combined effects of task size and work group size on perceptions of the core job characteristics and the motivating potential of the job. Specifically, increases in work group size should adversely affect independent observers' perceptions of Skill Variety, Task Significance, Task Identity, Autonomy, and Feedback and ultimately the motivating potential of the job, while increases in task size (through horizontal job loading) should positively affect these perceptions. In addition, understaffed work groups should be rated highest on these dimensions, followed by adequately and overstaffed work groups. Verification of these hypotheses would solidify the relationship between industrial and ecological psychological perspectives regarding organizational behavior.

## Method

### Subjects

Forty subjects (20 male, 20 female) were recruited from undergraduate classes at the University of Nebraska at Omaha. In return for

their participation in the experiment, subjects received extra credit in their respective courses.

Stimulus Materials

Four videotaped work settings were used as the stimulus material. Each tape showed a group of males working on an assembly line task, i.e., assembling tennis racket presses. Workers were separated by partitions which prevented them from interacting with one another. In general, the task constituted putting together two wooden frames and connecting these frames with four bolts, four springs, and four wing nuts. The precise number of tasks and workers assembling the tennis racket presses constituted the two independent variables.

Independent Variables

Four versions of the videotaped work setting were produced. Each tape depicted one of four experimental conditions in a 2 (work group size) x 2 (task size) factorial design. In half the conditions two workers were on the assembly line, while in the remaining conditions four workers were present (see Figure 1). The manipulation of work group size and task size result in three conceptual points on a staffing continuum from understaffed through adequately staffed to overstaffed conditions. These are represented by the ratio of workers to tasks in each condition, respectively. Viewed in this way, the 2 workers/2 tasks and 4 workers/4 tasks cells are both relatively adequately staffed, but differ in the absolute number of workers and tasks.

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Insert Figure 1 about here

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Task size (horizontal job loading) was manipulated by having the

work groups complete either two tasks or four tasks. In the four-task conditions workers assembled the top (four-sided) frame (Task 1), the bottom wooden frame (Task 2), the four bolts and springs (Task 3), and put the top frame on the completed task three and screwed on the four wingnuts (Task 4).

In order to maintain comparability across the four experimental conditions, all groups had to manufacture a completed product. Thus, in the large adequately staffed condition (4 worker/4 task) each worker completed one of the four tasks. However, the overstaffed condition (4 worker/2 task) could only be accomplished by providing the workers with tasks 1 and 2 preassembled, leaving tasks 3 and 4 to be completed by four workers. Consequently, it was necessary to divide these tasks (3 and 4) into subtasks. Thus, task 3 had two subtasks: pushing a bolt through each of the four holes at the corners of the bottom frame (Subtask 3A) and placing a spring onto each of the bolts (Subtask 3B). Task 4 also contained two relatively simple subtasks: positioning the top frame on the bolts of the bottom frame (Subtask 4A) and screwing a wingnut onto each of the four bolts (Subtask 4B).

To summarize, in the 4 worker/4 task (large adequately staffed) videotape each worker performed one of the four major tasks. In the 2 worker/2 task (small adequately staffed) tape, one worker performed Task 3 while the other performed Task 4. In the 2 worker/4 task (understaffed) tape, one worker performed Subtasks 3A and 3B and the other Subtasks 4A and 4B. Finally, in the 4 worker/2 task (overstaffed) videotape each worker performed one of the four subtasks (3A, 3B, 4A, or 4B).

Design and Procedure

The four videotaped work settings were shown to all subjects. Subjects were randomly assigned to a videotape sequence condition in a Latin square design in order to avoid any effects due to order of presentation. Consequently, the complete experimental design was 2 (work group size) x 2 (task size) x 2 (sex) x 4 (order).

Subjects were run in groups ranging in size from five to 10. The experimenter explained that they would view four videotaped work settings and would complete a questionnaire concerning the entire job after viewing each tape. After the completion of the last questionnaire, subjects were debriefed and dismissed.

Dependent Variables

Data were collected through a modified version of the Job Rating Form (JRF) (Hackman & Oldham, 1974). The JRF as opposed to the JDS was designed for use by observers rating a job rather than by employees themselves. Hackman and Oldham report that the median correlation of employees' and observers' job characteristics ratings was .63. Thus, job characteristics ratings of observers was felt to be a relatively accurate index of how employees would perceive the same job.

The JRF in its original form consists of 21 items rated on 7-point scales assessing observers' perceptions of the job's Skill Variety, Task Identity, Task Significance, Autonomy, Feedback from the Job Itself, Feedback from Agents, and Dealing With Others. The version employed in this study eliminated the items concerning Feedback from Agents and Dealing With Others since this information was lacking in the stimulus material. Consequently, the remaining job dimensions

were assessed by a 15-item questionnaire.

The Motivating Potential Score (MPS) was computed according to the procedures detailed in Hackman and Oldham (1974) and was derived by the following formula:

$$MPS = \left[\frac{\text{Skill Variety} + \text{Task Identity} + \text{Task Significance}}{3}\right] \times (\text{Autonomy}) \times (\text{Feedback from the Job})$$

## Results

### Sex Effects

Initially the data were analyzed to determine if any sex effects were present. Results indicated that no significant main effects or interactions were obtained. Consequently, this factor was dropped from further analyses.

### Work Group Size Effects

Table 1 shows that the small work group had a positive effect on observers' ratings of the job dimensions of Skill Variety, Task Identity, Autonomy and Feedback from the Job relative to the large work group. Similarly, the small work group was perceived as having a more potentially motivating job compared to the large work group.

Insert Table 1 about here

### Task Size Effects

Table 2 shows that a larger task size significantly increased observers' ratings of Skill Variety and Feedback from the Job dimensions. The job dimensions of Task Identity, Task Significance and Autonomy were seemingly unaffected by the task size manipulation.

However, the motivating potential of the job was positively affected by increasing task size.

Insert Table 2 about here

Work Group Size x Task Size Effects

The Skill Variety job dimension was the only dependent measure that yielded a significant interaction effect, $F(3, 36) = 3.51$, $p < .05$. An analysis of the means indicated that the 2 workers/4 tasks condition was rated significantly higher on this dimension than the other three conditions. Since this interaction is conceptually similar to our definition of staffing, the discussion of this effect is more appropriately presented in that section of the results.

Staffing Effects

Analyzing the data to account for differences due to staffing was accomplished through students' t-tests (2-tailed) for correlated dependent measures. It was expected that the understaffed work group (2 workers/4 tasks) would be rated significantly higher on the dependent variables than the overstaffed work group (4 workers/2 tasks) and higher than either of the adequately staffed groups (4 workers/4 tasks or 2 workers/2 tasks). Similar effects were predicted for the comparison between the overstaffed work group and the adequately staffed work groups. No differences were anticipated between the two adequately staffed groups.

Skill Variety. As shown in Table 3, the understaffed work group ($M = 2.07$) was rated significantly higher than the overstaffed work group ($M = 1.37$). Similarly, the understaffed work group was rated

significantly higher than the small adequately staffed group (2 workers/ 2 tasks) (M = 1.59) and the large adequately staffed group (4 workers/ 4 tasks) (M = 1.50). No significant differences were found between the overstaffed work group and the adequately staffed groups. In addition, the adequately staffed groups were not significantly different from each other.

Insert Table 3 about here

Task Identity. Table 3 also shows that the understaffed group (M = 2.89) was rated significantly higher on this dimension than the overstaffed work group (M = 2.38). The only other significant difference was obtained between the small adequately staffed group (M = 2.91) and the overstaffed work group.

Task Significance. No significant effects were found between any of the staffing conditions on this variable.

Autonomy. Again, Table 3 indicates that the predictions regarding work group staffing were partially supported. The understaffed work group (M = 3.04) was rated higher by observers than the overstaffed work group (M = 2.45) and the large adequately staffed work group (M = 2.48). In addition, observers rated the small adequately staffed group's job (M = 2.87) as possessing more autonomy for the workers than that of the overstaffed work group. Contrary to expectations, a significant difference was found between the two adequately staffed work groups. The job for the small adequately staffed work group was rated higher in Autonomy than the job for the large adequately staffed work group. None of the remaining comparisons yielded significant differences.

Feedback from the Job. Observers rated the understaffed work group's job as possessing significantly more Feedback (M = 3.28) than the overstaffed work group's job (M = 2.58) and more Feedback than the large adequately staffed work group's job (M = 2.84). The only other significant comparison was between the small adequately staffed work group (M = 3.07) and the overstaffed work group (see Table 3).

Motivating Potential. Consistent with the above results, Table 3 indicates that the understaffed work group had a higher MPS (M = 30.20) than either the overstaffed work group (M = 14.56) or the large adequately staffed work group (M = 16.89). Furthermore, the MPS for the small adequately staffed work group (M = 24.07) was significantly higher than that for both the overstaffed work group and the large adequately staffed work group. For the most part, these data confirm the predictions based on manning theory. That is, understaffed work groups possess greater amounts of the requisite job attributes needed for an enriched job than either adequately or overstaffed work groups. However, the data also indicate that adequately staffed groups differing in task and work group sizes are not perceived as identical in the degree to which the job possesses the potential to motivate an employee.

Presentation Order Effects

The analysis of variance utilized in determining the effects of work group size and task size on the above variables included the order in which observers were presented the videotapes. A significant two-way interaction was found between presentation order and work group size for the observers' ratings of Skill Variety, $F(3, 36) = 3.51$, $p < .05$. Observers may have been evaluating this dimension for later

work settings relative to their ratings on earlier settings. Thus, caution should be taken in interpreting the effect of work group size on Skill Variety. However, the main effect for work group size is still in the predicted direction.

## Discussion

The results of this study supported the hypotheses concerning the impact of work group size and task size on observers' job characteristics ratings. Although both factors significantly affected the perceived motivating potential of the job, work group size appears to have a more potent effect. This is evident not only in consistently higher percentage of variance (omega square) estimates for work group size (see Tables 1 and 2), but also with respect to the number of job characteristics that were significant. Skill Variety and Feedback from the Job were significantly influenced by both work group and task size manipulations. However, the observers ratings of Task Identity and Autonomy were only affected by work group size. This latter result may have been due to the relative saliency of the number of workers as compared to the number of tasks the workers were performing. It is quite plausible that workers would have more divergent perceptions if the tasks were salient than their coworkers. This, however, cannot be ascertained in the present study since observers only were utilized.

It is interesting to note that neither work group size nor task size had any significant effect on Task Significance. An inspection of the items from the JRF may shed some light on these results. The three items used to measure Task Significance concerned the impact of the job itself on the lives and well-being of other people. Obviously,

the production of tennis racket presses has little impact on the lives of other people (especially those external to the organization). Thus, the two manipulated variables should have had little effect on this dependent variable. Future research efforts should investigate the effects of focusing these questions toward the impact of the job on others within versus outside of the organization.

These experimental findings also partially support manning theory's predictions regarding job redesign (Greenberg, 1979). Overall, jobs performed by the understaffed work group were perceived as being higher on the job dimensions of Skill Variety, Task Identity, Autonomy, and Feedback from the Job than the overstaffed work group. Consequently, the motivating potential of the understaffed work group's job was higher than the overstaffed work group's job. The data also suggest that staffing of a work group is linearly related to observers' perceived motivating potential of the job. The highest MPS was obtained in the understaffed work group condition, and the lowest MPS was found in the overstaffed work group condition. The adequately staffed work groups yielded MPS values in between the two extreme staffing conditions. The results of this study support the notion that an ecological psychological analysis of work groups can augment our understanding of organizational structure effects found in extant industrial psychology literature (Greenberg, 1979).

The only major shortcoming of the ecological psychology approach to studying job enrichment was found in the data concerning the comparison between the two adequately staffed work groups. Contrary to hypotheses, the variables of Autonomy and MPS yielded significant

differences between the large adequately staffed and small adequately staffed work groups. The smaller sized adequately staffed work group was rated higher on Autonomy and was given a higher MPS value than its larger counterpart. If staffing is conceptualized as the ratio of work group size to task size, no significant differences should have emerged. Nonetheless, the data tend to suggest that work group size plays a more important role in observers' evaluations of Autonomy and the overall motivating potential of the job for these groups. This result may have been caused by a greater saliency of work group size than task size for this particular job. An alternative explanation is that the ratio of work group size to task size is too simplistic. Rather, work group size should be weighted more heavily than task size. However, this remains to be determined by future research endeavors.

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Table 1

Results of Job Characteristics Ratings and MPS Scores for Work Group Size

| Dependent Variable | Mean Score for 2 Workers | Mean Score for 4 Workers | F | % Variance |
|---|---|---|---|---|
| Skill Variety | 1.83 | 1.44 | 13.66** | 9.69 |
| Task Identity | 2.90 | 2.57 | 5.55* | 4.00 |
| Task Significance | 2.45 | 2.62 | 1.05 | .01 |
| Autonomy | 2.96 | 2.47 | 13.96** | 11.78 |
| Feedback from the Job | 3.18 | 2.71 | 8.04** | .08 |
| MPS | 27.14 | 15.73 | 14.58** | .16 |

Note: df = 1, 36

*$p < .05$

**$p < .01$

Table 2

Results of Job Characteristics Ratings and MPS for Task Size

| Dependent Variable | Mean Score for 2 Tasks | Mean Score for 4 Tasks | F | % Variance |
|---|---|---|---|---|
| Skill Variety | 1.48 | 1.79 | 10.49** | 5.74 |
| Task Identity | 2.65 | 2.83 | 1.84 | 1.20 |
| Task Significance | 2.59 | 2.47 | 1.24 | .01 |
| Autonomy | 2.66 | 2.76 | 1 | .50 |
| Feedback from the Job | 2.83 | 3.06 | 4.12* | .02 |
| MPS | 19.32 | 23.55 | 4.31* | .02 |

Note: df = 1, 36

*$p < .05$

**$p < .01$

Table 3

Summary of Significant Results for Staffing Effects on Job Characteristics Ratings and MPS

| Dependent Variables | Work Groups | Work Groups: US | OS | LAS |
|---|---|---|---|---|
| Skill Variety | OS | 4.35** | | |
| | LAS | 3.22** | | |
| | SAS | 3.19** | | |
| Task Identity | OS | 2.41* | | |
| | LAS | | | |
| | SAS | | 3.14** | |
| Autonomy | OS | 2.98** | | |
| | LAS | 3.28** | | |
| | SAS | | 2.16* | 2.82* |
| Feedback | OS | 3.17** | | |
| | LAS | 2.16* | | |
| | SAS | | 2.29* | |
| MPS | OS | 4.43*** | | |
| | LAS | 3.77*** | | |
| | SAS | | 3.55*** | 2.52* |

Note: US = Understaffed (2 Workers/4 Tasks); OS = Overstaffed (4 Workers/2 Tasks); LAS = Large Adequately Staffed (4 Workers/4 Tasks); SAS = Small Adequately Staffed (2 Workers/2 Tasks).

Two-tailed *t*-tests, df = 39

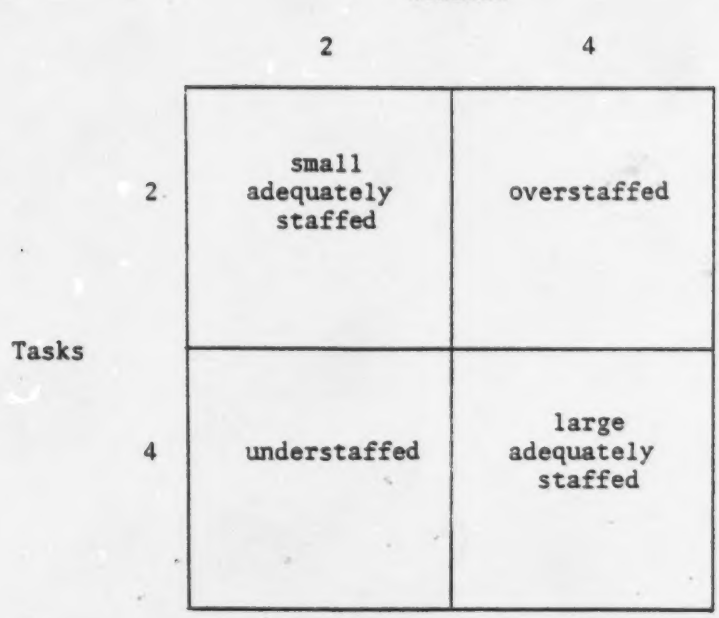
*$p < .05$

**$p < .01$

***$p < .001$

## Figure Caption

Figure 1. Staffing conditions as a function of experimental manipulations.


Workers
2
4
Tasks
2
4
small adequately staffed
overstaffed
understaffed
large adequately staffed